

Three soil-cover scoring methods to assess cover crops between two sugarcane cycles

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Abstract

On Reunion Island, the sugar cane industry is seeking to improve its agricultural practices to methods that are more agro-ecologically based. Through a national plan of pesticide reduction, eRcane leads an experimental project that tests weed control methods between sugarcane crop cycles. Based on cover crop layout, such practices have a potential to reduce herbicide usage while preserving soil fertility (physical, chemical and biological properties). Soil-cover by weeds and cover plants is assessed by three scoring methods: (i) a visual method, (ii) a linear method based on a transect, and (iii) a drone method. The objective is to determine advantages and limitations of each method in terms of accuracy and pace at which it is achieved.

An experiment was carried out in 2015 in a farmer's field. Treatments compared the sowing of two cover plants, *Crotalaria juncea* and *Vigna unguiculata*, with control plots where cover crops were not sown between sugarcane crop cycles (the farmer's practice). The trial was laid out in strip plots over a total area of 4 acres. The visual and linear scoring methods were performed by technicians every 20-25 days for 2.6 months, with qualitative and quantitative observations. The drone measurement was performed only once at the end of the test by a service provider. The image acquisition was done using both RGB (Red Green Blue) and near-infrared (NIR) images. An image analysis was used to compare the three methods.

The results show that the methods provided different information. Thus, on a plot with several vegetation strata, the linear method appeared to be the most accurate but most time-consuming. Visual scoring of soil-cover by vegetation, which is faster in the field, simplified data analysis but did not identify species under the upper vegetation stratum. The drone, on the other hand, widened observations of groundcover by vegetation to larger areas at greater speed but with lack of accuracy in differentiating species.

If visual and linear observations remain the most commonly used methods for assessing agricultural systems due to their accuracy levels, they imply constraints in terms of time and labor resources. The concept of precision farming and, in particular, aerial observation of crops by drones, remains an interesting approach at farm scale. Although good resolution images are obtainable with this method, there is a need for improvements in the algorithms that are used to differentiate a cover crop from a weed. Once these improvements have been made, it would be interesting to repeat this experiment for better comparisons.

Keywords: sugarcane, Reunion island, herbicide, cover crop, drone, scoring methods.